

REMARKS

The indication that drawings filed on March 17, 2003, are accepted by the Office is noted with appreciation.

The acknowledgment of a claim for foreign priority under 35 U.S.C. §119 is also noted with appreciation.

Claims 2 to 8 and 10-15 are currently active in the application. Applicant thanks the Examiner for indication that claims 3-8, 10 and 11 are drawn to the allowable subject matter. By the present amendment claims 2-3, 14 and 15 have been amended to more clearly described the present invention. Specifically, presently amended claim 3 is now written into independent form by including all of the limitations of claim 15 and reflects the essence of the present invention. The support for amendment of claims 2-3, 14 and 15 can be found at least in Figure 6 and pages 18-19 of the specification. No new matter is presented by this amendment. Reconsideration of the claims in a view of the present amendment is respectfully requested.

Claims 2, 12-15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over the patent to Wen (U.S. Patent 6,046,822) in view of Nakajima et al. (U.S. Patent 6,025,929). This rejection is respectfully traversed based on the following discussion.

As was discussed previously, the present invention provides a method allowing to print a high quality image by controlling both: an ejection speed individually for each nozzle and ink ejection amount of an ink droplet for each nozzle. In order to coordinate the difference between the ejection speed Vd and the ink ejection amount m for each nozzle the claimed printer performs the ink ejection control so that an impact position Y of an ink droplet and an ink ejection amount m are adjusted at the same time for each nozzle in addition to adjustment of the ink ejection speed Vd . An adjustment procedure specifically takes place in the nozzle data converting portion 204 (see Figure 4), shown in greater detail in Figure 6 and described in the specification. Constructively, the Nozzle Data

Converting Unit Portion 204 comprises a profile data update unit 101 and a measuring unit 102. According to the present invention, the profile data update unit 101 executes an updating process for updating the Y coordinate values and pulse data of the nozzle profile data based on a command indicating a target impact position Y_n and a target ink ejection amount M . The updating process includes a two stages. At the first stage, an ink ejection amount m of each nozzle is adjusted and at the second stage, an impact position Y of an ink droplet on a recording sheet is adjusted.

The patent Wen et al. discloses an image printing apparatus. The invention to Wen et al. improves an accuracy of ink droplet placement by compensating for jet direction variabilities between ink nozzles. More specifically, Wen et al. discloses a technology for eliminating the positional error by changing the ejection timing. It should be noted that Wen et al. does not disclose a technology for eliminating the difference of ink volumes among the nozzles.

The patent to Nakajima et al. discloses an image processing apparatus which can set an image process in accordance with a usage of an output image. Specifically, Nakajima et al. teaches correction of an inputted image in accordance with a pixel position defined by a set level of image quality and image processing speed. As described above the reference to Wen et al., the patent to Nakajima et al. is also silent about an ink amount adjustment. Therefore, since the reference to Nakajima et al. does not make up for the deficiencies of the patent to Wen et al., the combination of Wen et al. and Nakajima et al. does not show or suggest the invention as presently claimed.

In order to emphasize the distinction, claim 15 has been amended to include the limitation of adjustment ink volume for each nozzle. Specifically, as amended, claim 15 now cites, "An ink jet recording device comprising:

- a head formed with a plurality of nozzles;

- a converting unit that converts recording data into driving data that defines

driving pulses of corresponding ones of the plurality of nozzles and includes:

a profile data update unit which adjusts an ink ejection amount m of each nozzle and impact position Y of an ink droplet on recording medium for each nozzle, and

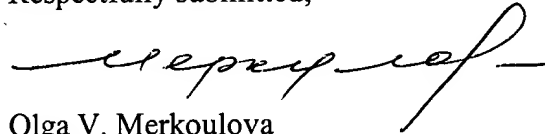
a measuring unit which determines a center position of an ink dot for each nozzle;" (Emphasis added) As amended, it is submitted that claim 15 clearly defines over the patent to Wen et al. Since the rest of the claims directly or indirectly depend from the amended claim 15, it is respectfully submitted that all claims are in condition for allowance. Furthermore, the currently amended claim 3 incorporates all the limitations of claim 15 and is also inventive over the reference to Wen. Since an ink jet printing apparatus of Wen can adjust only the placement error (impact position) by changing the ejection timing. An amount of ink ejected from each nozzle cannot be adjusted. Contrarily, the present invention can adjust not only the impact position Y of an ink droplet on a recording medium but also the ink ejection amount m . More importantly, Wen cannot update the adjustments initially performed. As shown in Figure 2, adjustment is performed with the use of predetermined pulse parameters which are the time delays before start of pulses T_{rij} and T_{bij} , pulse width ($W1, W2, W3 \dots$), voltage pulse amplitudes ($A1, A2, A3 \dots$), and time delays ($S1-2, S2-3 \dots$). Contrarily, with the profile data update unit, the present invention can update nozzle profile data. The nozzle profile data being updated, the waveform and generating timing of the driving data for each one of the plurality of nozzles are also updated. As such, the driving data can be replaced by any other suitable driving data by virtue of the profile data update unit, when printing condition is changed because of, for example, change in recording sheet material, printing speed, nozzle temperature, and kind of ink to be used.

In view of the foregoing, it is respectfully requested that the application be reconsidered, that claims 2 to 8 and 10-15 be allowed, and that the application be passed to issue.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

A provisional petition is hereby made for any extension of time necessary for the continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041 (Whitham, Curtis & Christofferson, P.C.).

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'O. Merkoulouva', with a long horizontal stroke extending to the right.

Olga V. Merkoulouva
Reg. No. 48,757

Whitham, Curtis & Christofferson, P.C.
11491 Sunset Hills Road, Suite 340
Reston, VA 20190
Tel. (703) 787-9400
Fax. (703) 787-7557
Customer No.: 30743